TOPIC: INCREASING ANTIBIOTIC RESISTANCE IN GRAM-NEGATIVE BACILLI

PRESENTER: JAMES RAHAL, MD, CLINICAL PROFESSOR OF MEDICINE, CORNELL UNIVERSITY MEDICAL COLLEGE, AND CHIEF OF INFECTIOUS DISEASES, NEW YORK HOSPITAL MEDICAL CENTER OF QUEENS, FLUSHING, NEW YORK*

Since the 1950s, some have divided antimicrobial resistance into two forms: hospital acquired and community acquired. This division is useful both mechanistically and epidemiologically and can be applied to gram-negative bacilli.

Gram-negative bacilli produce either chromosomal or plasmid-mediated β-lactamases. That is the major clinically important difference between the β-lactamases in terms of treating patients. The chromosomal-mediated β-lactamases are found primarily in hospital-associated organisms in the intensive care unit; they have developed the ability to inactivate the latest cephalosporins. Plasmid-mediated β-lactamases are most common in community-associated organisms, which, until now, have been susceptible to third-generation cephalosporins.

Chromosomally mediated resistance is not passed horizontally from organism to organism, but rather is passed only vertically. Thus, an infecting organism must multiply to 10 or 100 million in order to yield 100 or 1,000 resistant mutants. Reasonable cleanliness in intensive care units should enable control of resistance due to this mechanism.

Among community-acquired gram-negative bacilli, resistance genes are carried primarily on plasmid, rather than chromosomal, DNA. Plasmid DNA may be passed horizontally between infecting organisms. Recently, plasmid-mediated resistance to the latest generation of cephalosporins has occurred in hospital-associated gram-negative bacilli. The inactivation of a late-generation cephalosporin by that plasmid-mediated β-lactamase threatens to leap from hospital-acquired organisms into the community. An example of this can be seen in a *Salmonella* species in Spain that is resistant to third-generation cephalosporins.[1] The ominous implication is that if a plasmid-mediated β-lactamase that can inactivate late-generation cephalosporins spreads to these type of organisms, we will be in much more trouble. Many believe that this is predictable.

Evidence is increasing that a combination of β-lactamase activity and decreased penetrability of antibiotics into bacteria determines the ultimate clinical susceptibility of many organisms. Chromosomally mediated β-lactamases have the capacity to disrupt the structure of late-generation cephalosporins. Recently, plasmid-mediated β-lactamases have taken on the character of the chromosomal

*Dr. Rahal's address is New York Hospital Medical Center of Queens, Infectious Disease Section, 6th Floor, 56-45 Main Street, Flushing, NY 11355-5095.

β-lactamases and now also are able to inactivate third-generation, as well as second-generation, cephalosporins. Such resistance may now be spread by plasmid transfer to community-acquired organisms such as *Salmonella.*

REFERENCE

1. Morosini MI, Canton R, Martinez-Beltran J, *et al.* New extended-spectrum TEM-type beta-lactamase from *Salmonella enterica* susp. *Enterica* isolates in a nosocomial outbreak. *Antimicrob Agents Chemother.* 1995;39:458–461.

TOPIC: VANCOMYCIN-RESISTANT ENTEROCOCCI

PRESENTER: RICHARD B. ROBERTS, MD, PROFESSOR OF MEDICINE, CORNELL UNIVERSITY MEDICAL COLLEGE, NEW YORK, NEW YORK*

The increasing incidence of vancomycin-resistant *Enterococcus faecium* (VRE) in New York City has been described in several studies, beginning in 1989, when the New York City Department of Health documented 360 patients with VRE from almost 47% of the city's hospitals.[1] A second survey, published by the New York City Department of Health in 1993, indicated that cases of VRE had occurred in all but two small surgical hospitals in the city.[2]

The incidence of VRE in New York State, while lagging behind New York City, has increased in a similar fashion: more than 50% of counties have documented cases in the past three years (D. M. Ackman, personal communication). Preliminary analysis of data collected by the Centers for Disease Control and Prevention regarding the incidence of VRE in the US indicate that New York City, similar to its role in the epidemics of HIV and multidrug-resistant tuberculosis, remains the country's epicenter of VRE infection. In the US, the majority of VRE cases have been seen in tertiary care hospitals, predominantly in intensive care units.[3]

International studies regarding VRE have accompanied a concern that associated infections may not remain a nosocomial phenomenon. Reports from Great Britain indicate that 2% of patients in general practices that have not utilized antibiotics and that have not been admitted to a hospital are carriers of VRE.[4] In addition, VRE has been isolated in human waste sewage from treatment plants in five major cities in both the United Kingdom and Europe.[5,6] The VRE organisms also have been isolated in Europe from fecal samples from farm animals, mostly pigs and poultry.[7]

Suggestions for infection control policies to decrease the incidence of VRE were published in the February 1995 edition of *Infection Control and Hospital*

*Dr. Roberts's address is Department of Medicine, New York Hospital–Cornell Medical Center, 525 East 68th Street, New York, NY 10021.